(12) UK Patent Application (19) GB (11) 2 381 391 (13) A

(43) Date of A Publication 30.04.2003

(21) Application No 0224563.7

(22) Date of Filing 22.10.2002

(30) Priority Data
(31) 0113837 (32) 25.10.2001 (33) FR

(51) INT CL[7]
H01R 13/639

(52) UK CL (Edition V)
H2E ECCE

(56) Documents Cited
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(58) Field of Search
UK CL (Edition V) H2E
INT CL[7] H01R
Other: Online: WPI, EPODOC, JAPIO

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(54) Abstract Title
A connection system with reinforced locking

(57) A connection assembly (1) comprising a base member (2) and a plug member (5) which can be fitted together and are retained together by a locking ring (6). The locking ring is adapted to be screwed on to an outer periphery (10) of the base member and is retained on the plug member (5). In order to secure the screwed position, an inner periphery (8) of the ring is provided with a friction means (14), e.g. a spiral collar, compressed between the ring and the base member so as to hold them in position, since the turns on the friction means absorb any vibration to which the base member and/or the plug member is exposed.

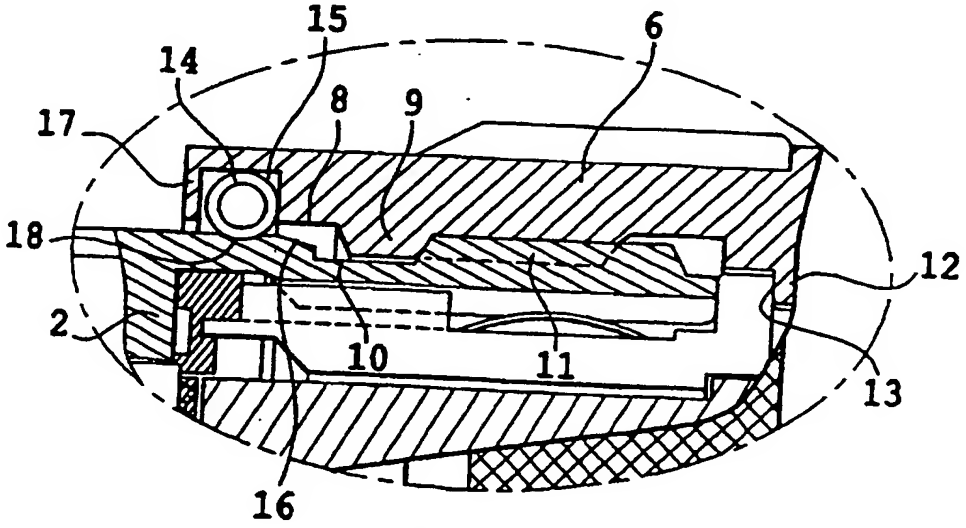

Fig. 2

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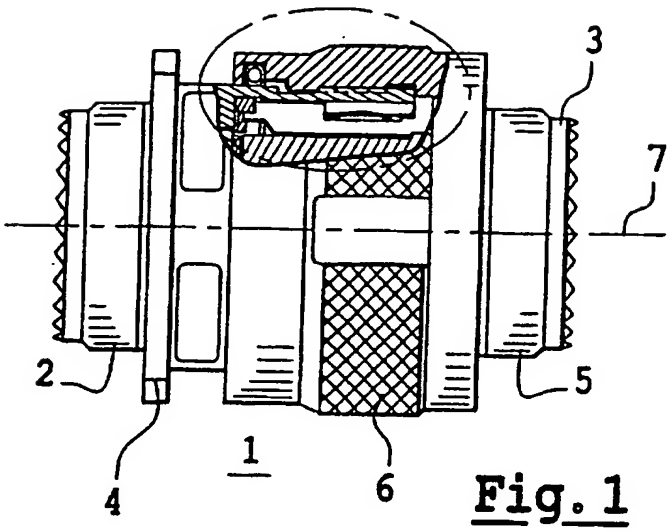

Fig. 1

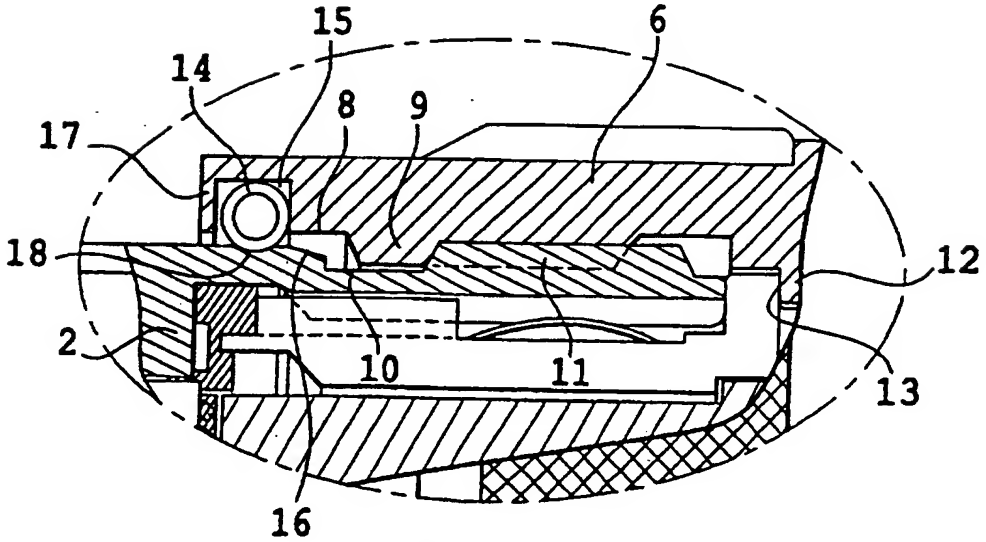

Fig. 2

A connection system with reinforced locking

The invention relates to a connection system with reinforced locking. It is of use more particularly in connection assemblies comprising at least one base member complementary with a plug, the plug being fitted in the base member and retained thereon by a ring for locking the plug. The importance of the invention is that it provides a connection assembly which remains reliably locked even when the connection assembly is exposed to difficult mechanical conditions. Under strong vibration in particular, a connection assembly according to the invention can prevent uncoupling of the base member from the plug. Strong vibration can occur inter alia in aerial navigation, in airborne devices.

The prior art, inter alia the teaching in the document FR-A-2 696 049, discloses an electric connector comprising a threaded ring, the threaded ring being adapted to co-operate with external threading on a complementary connector. According to the citation, the connector also comprises an overriding locking means. The overriding locking means has asymmetrically shaped teeth adapted to co-operate with the teeth of the connector and thus prevent unscrewing of the ring from the complementary connector.

The means is e.g. an overriding toothed collar. In particular, the respective teeth abut one another until they become totally immobilised when the

threaded parts have been screwed to the maximum extent. The overriding locking means considerably increases the torque required for unscrewing the ring, whereas the ring can still be screwed by a weak torque.

The prior-art locking means pose a problem. Although they are competitive, there are constraints during operation. In order reliably to hold the locking ring on the base member, it is necessary to provide an overriding locking collar in addition to the ring. The collar poses a problem in that it has to be fitted separately. It is therefore an additional part which is fitted and removed independently when the connectors are coupled and uncoupled. The ring can be lost and is therefore a source of independent, additional consumables required for making the said secure locking connections.

The object of the invention is to solve the said problem by providing a connecting assembly comprising a locking ring, the locking ring itself comprising an additional means for securing the lock. The additional lock-securing means is a means which is retained inside the locking ring, either when screwed on to the base member when the plug is connected thereto or when the ring is free around the plug and the plug is disconnected from the base member.

The means retained in the interior is a friction means adapted to be constrained between the plug and the base member. During the assembly of the plug and the base member, the means generate friction forces which progressively oppose a screwing force. The more the ring is screwed on to the base member, the more difficult screwing becomes. Unscrewing is also difficult, thus reliably preventing unscrewing under strong vibration.

The invention relates to a connection assembly comprising a base member and a plug, the plug comprising a plug member and a rotary locking ring and the ring comprising a threaded part at the level of an inner periphery, the threaded part co-operating with a threaded outer periphery of the base member, characterised in that the locking ring comprises a friction means disposed at the level of the inner periphery of the ring and adapted to be compressed between the said inner periphery and the outer periphery of the base member in order to keep the plug member mounted on the base member.

The invention will be more clearly understood from the following description and the accompanying drawings. The drawing are given by way of indication and in no way limit the invention. In the drawings:

Fig. 1 is a longitudinal view partly in section of a connection assembly according to the invention, and

Fig. 2 is a larger-scale longitudinal section through a portion of the connection assembly in Fig. 1.

Fig. 1 shows a connection assembly 1 according to the invention. The connection assembly 1 comprises a base member 2 and a plug 3. In Fig. 1, the plug 3 is connected to the base member 2. Preferably the connection assembly 1 is an electric connection assembly. To this end, the base member 2 and the plug 3 have respective contacts for connecting together and complementary with one another. The base member 2 and the plug 3 are preferably adapted to receive cables. Cable cores are each connected to a contact on the base member or the plug. The base member 2 can also be rigidly fitted on to a holder via a collar 4. The collar 4 can have orifices e.g. for screwing into a holder.

The plug 3 comprises a plug body 5 surrounded by a locking ring 6. The locking ring 6 is retained in the plug member 5. It is free to rotate around the plug member 5 but is retained in an axial direction, i.e. along an axis 7 of the coupling between the base member 2 and the plug 3. In other words, the ring 6 can rotate around the axis 7. If required the ring 6 can slide longitudinally, within certain limits, along the axis 7.

When the plug 3 is connected to the base member 2, the connection is maintained by moving the ring 6 so that it co-operates with the base member 2. In a

preferred embodiment, when the plug 3 is connected to the base member 2, the plug member 5 is inserted into the base member 2. The locking ring 6, on the other hand, is then disposed around the base member 2. For easier handling, the locking ring 6 has a latticed or irregular portion on its outer periphery, to improve gripping by the hand or by a robot.

The locking ring 6 corresponds to a sleeve. Globally and schematically it is in the shape of a hollow cylinder through which the plug member 2 and the plug member 5 can be slid and connected. As shown in Fig. 2, the locking ring 6, at the level of an inner periphery 8, has a threaded part 9. The threaded part 9, which is parallel to the axis 7, is adapted to co-operate with a likewise threaded portion 11 of an outer periphery 10 of the base member 2. Since the sleeve formed by the locking ring 6 surrounds the base member 2, the outer periphery 10 of the base member 2 will then be opposite the inner periphery 8 of the ring 6.

To ensure maximum locking, the locking ring 6 is rotated around the axis 7 so as to engage the threaded part 9 in the threaded portion 11. Screwing is continued until an inner set-back portion 12 of the locking ring 6 abuts a front edge 13 of the base member 2.

In order to secure the locking ring 6 in position on the base member 2, a friction means 14 is also

provided. The friction means 14 is preferably retained on the inner periphery 8 of the ring 6. The means 14 projects appreciably from the inner periphery 8, so that when the ring is screwed, the means 14 comes into contact with the base member 2. Preferably the friction means 14 is retained in a groove 15 in the inner periphery 8. The groove 15 has a depth such that the friction means 14 slightly projects from a profile formed by the inner periphery 8. The more the ring is screwed on to the base member 2, the more the ring 6 advances along the axis 7 and the friction means 14 is compressed between the inner periphery 8 of the ring 6 and the outer periphery 10 of the base member 2. Preferably the more the ring 6 is screwed around the base member 2, the higher the coefficient of friction between the ring 6 and the base member 2. There is therefore a progressive increase in the torque needed for screwing.

In a preferred embodiment the friction means 14 is a spiral collar. A spiral collar is a spiral spring forming a toroidal structure. It comprises juxtaposed turns. Owing to the turns, the ring is flexible. It can for example be constrained in different directions. The means 14 can be formed by connecting the two opposite ends of a standard (cylindrical) spiral spring, so that it takes the general shape of a toroid. In that case the two ends are preferably soldered to strengthen the collar.

In a preferred embodiment, to ensure that the means 14 is retained in the groove 15, the collar 14 is shaped so that an outer periphery of the collar is slightly longer than the inner periphery 8. In that case the spiral collar 14 can be shaped from a spiral tube having a length greater than the said inner periphery 8. Thus, when the collar 14 is formed, it is compressed and therefore retained in the groove 15. In a variant, the friction means 14 can likewise consist of a resilient collar slightly greater in diameter than an interior diameter of the ring 6 at the level of the groove 15. In this variant the resilient collar is likewise compressed between the edges of the groove 15.

The value of proposing a friction means 14 such as a spiral collar is that the turns of the collar absorb, without transmitting, any vibration undergone by the plug member 5 or the base member 2. Also this kind of means 14 has a large contact surface, i.e. friction surface.

To improve the reliability of locking by the friction means 14, the outer periphery 10 of the base member 2 is given a progressive slope 16. The slope 16 is determined so that when the threaded part 9 is screwed to the threaded portion 11, the friction means 14 at the beginning does not rub against the outer periphery 10. By contrast, when screwing is nearly at the maximum and the rear set-back portion 12 abuts the edge 13, the friction means 14 is disposed at the level of a front part 17

of the ring 6 and the front part 17 is at the level of the slope 16. Owing to the slope 16, therefore, the outer periphery 10 is increasing at the level of the slope 16. The sleeve formed by the ring 6 is uniform, and consequently the more the ring 6 is screwed around the base member 2, the more the friction means 14 is constrained between the slope 16 and the groove 15.

In a variant, in the said maximum screwed position the friction means 14 can engage in a groove 18 formed on the outer periphery 10. In this way, when the friction means 14 is locked between the groove 15 and the groove 18, even strong vibration will be insufficient to withdraw the friction means 14 from its recess.

In contrast to some devices in the prior art, the present device has the advantage of having a strong unscrewing torque, thus limiting unscrewing when the connectors are exposed to strong vibration for prolonged periods.

C L A I M S

1. A connection assembly (1) comprising a base member (2) and a plug (3), the plug comprising a plug member (5) and a rotary locking ring (6) and the ring comprising a threaded part (9) at the level of an inner periphery (8), the threaded part co-operating with a threaded (11) outer periphery (10) of the base member, characterised in that the locking ring comprises a friction means (14) disposed at the level of the inner periphery of the ring and adapted to be compressed between the said inner periphery and the outer periphery of the base member in order to keep the plug member mounted on the base member.

2. An assembly according to claim 1, characterised in that the friction means is disposed in a groove (15) in the inner periphery of the ring and projects appreciably from the groove.

3. An assembly according to claim 1 or 2, characterised in that the friction means is a spiral collar.

4. An assembly according to claim 3, characterised in that the spiral collar is made by joining the two ends of a spiral tube.

5. An assembly according to claim 4, characterised in that the spiral tube initially has a length at

rest greater than the length of the inner periphery of the ring.

6. An assembly according to any of claims 1 to 5, characterised in that the outer periphery of the base member has a slope (16) such as progressively to increase the length of the outer periphery of the base member.

7. A connection assembly substantially as herein described with reference to the accompanying drawings.

Application No:	GB 0224563.7	**Examiner:**	Paul Nicholls
Claims searched:	1 - 7	**Date of search:**	11 February 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
E, X	1	GB 2,375,438 A	(VEAM) - See page 4 lines 15-21
X	1	GB 2,297,000 A	(WL GORE) - See member 50
X	1	GB 2,192,035 A	(PLESSEY) - See page 1 lines 99-123
X	1	US 6,113,410 A	(HEIT et al) - See column 4 lines 23-31
X	1	US 5,702,263 A	(BAUMANN et al) - See column 6 lines 26-41
X	1	US 5,199,894 A	(KALNY et al) - See column 6 lines 5-21
X	1	US 4,472,013 A	(FREAR) - See column 5 line 63 - column 6 line 4
X	1	US 4,359,254 A	(GALLUSSER et al) - See column 3 lines 46-58

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

H2E

Worldwide search of patent documents classified in the following areas of the IPC[V]:

H01R

The following online and other databases have been used in the preparation of this search report:

WPI, EPODOC, JAPIO